

## CLAIMS

1. A catamaran surface effect ship comprising a catamaran hull having a hull baseline, spaced apart hulls connected with a deck, and an integral propulsion system for propelling the hull,
  - 5 a) the hull having forward and aft flexible seals that enable pressured air to be trapped in an air space that is positioned generally in between the hulls and in between the seals,
  - b) the hull containing a powered lift fan system for transmitting air to the air space, and
  - 10 c) wherein each hull is absent chines, providing a smoothly curved bottom and side walls extending upwardly from the smoothly curved bottom.
2. The catamaran surface effect ship of claim 1, wherein each hull is tapered between hull bow and stern portions.
- 15 3. The catamaran surface effect ship of claim 1, wherein each hull has a generally semicircular bottom portion in transverse cross section.
4. The catamaran surface effect ship of claim 1, wherein the hull side walls are generally vertically oriented.
5. The catamaran surface effect ship of claim 1, wherein each hull stern
- 20 portion carries a propeller that comprises in part a propulsion device.
6. The catamaran surface effect ship of claim 5, wherein each propeller is able to operate in a surface piercing or fully submerged mode.
7. The catamaran surface effect ship of claim 1, wherein the propulsion system includes a propeller mounted on a propeller shaft.
- 25 8. The catamaran surface effect ship of claim 7, wherein the propeller shaft is oriented nearly parallel to the ship's bottom.
9. The catamaran surface effect ship of claim 8, wherein the propeller shaft is oriented above the ship's bottom.
10. The catamaran surface effect ship of claim 1, wherein the propulsion
- 30 system includes propellers, each propeller having a propeller shaft tube integral with the hull.

11. The catamaran surface effect ship of claim 10, wherein the propeller shaft tube does not extend below the baseline of the hull.
12. Apparatus including a vessel designed to operate as both a catamaran and air cushion vessel comprising:
- 5 catamaran hulls that are without hard chines, for traveling at low speed (Froude number between about 0 and about 0.3) in a displacement mode; a propulsion system that includes one or more surface piercing propellers, for operating at high speed (50+ knots (93+ km/hour)) in an air cushion, dynamically supported mode.
- 10 13. The catamaran surface effect ship of claim 12, wherein the propulsion system includes a propeller mounted on a propeller shaft.
14. The catamaran surface effect ship of claim 13, wherein the propeller shaft is oriented nearly parallel to the ship's bottom.
- 15 15. The catamaran surface effect ship of claim 13, wherein the propeller shaft is oriented above the ship's bottom.
16. The catamaran surface effect ship of claim 12, wherein the propulsion system includes propellers, each having a propeller shaft tube integral with the hull.
17. The catamaran surface effect ship of claim 16, wherein the propeller shaft tube does not extend below the baseline of the hull.
- 20 18. The apparatus of claim 12, wherein the vessel has a dynamically supported draft that is much less than its static draft.
19. The apparatus of any one of claims 12-18, wherein the catamaran hulls have parabolic waterlines.
- 25 20. The apparatus of any one of claims 12-19, further comprising a flexible air cushion seal system.
21. The apparatus of any one of claims 1-20, wherein the propulsion system includes combined diesel and gas turbine power generation units.
22. The apparatus of any one of claims 1-21, further comprising gas turbines for generating lift air pressure.
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23. The apparatus of any one of claims 1-22, further comprising forward mounted foil stabilizers for facilitating ride stabilization and load compensation, at high and low speeds.

24. The apparatus of claim 23, wherein the foil stabilizers generate  
5 transverse roll forces that improve high speed maneuvering.

25. The apparatus of claim 20 or any claim dependent on claim 20, wherein the air cushion seal system includes bow and stern seals that in combination with the hulls enable an air cushion to be formed under the vessel.

26. The apparatus of any one of claims 1-25, further comprising a deck  
10 and superstructure on the hulls.

27. The apparatus of any one of claims 12-25, wherein the hulls have smoothly curved bottom portions.

28. The apparatus of any one of claims 1-27, wherein the hulls have smooth side portions.

15 29. The apparatus of claim 28, wherein the side portions are generally vertically oriented.

30. The apparatus of any one of claims 1-29, wherein the hulls do not generate dynamic lifting forces.

31. The apparatus of any one of claims 1-30, wherein the hulls have  
20 smoothly curved bottom portions.

32. The apparatus of any one of claims 1-31, wherein the hulls are non-lifting side hulls.

33. The apparatus of claim 32, wherein the side hulls are molded (rounded) forms featuring parabolic waterlines and semi-elliptical cross sections to  
25 minimize the characteristic wave trains associated with low speed.

34. The apparatus of any one of claims 1-33, wherein small lifting surfaces provide load compensation, ride control and high-speed stabilization.

35. The apparatus of claim 34, wherein the small lifting surfaces comprise two independently controlled wing sections mounted port and starboard  
30 below the waterline, inboard and forward on the side hulls.

36. The apparatus of any one of claims 1-35, further comprising retractable air cushion seals.

37. The apparatus of any one of claims 1-36, wherein the hulls have sides that do not generate dynamic lifting forces.

5 38. A catamaran surface effect ship comprising a catamaran hull having a hull baseline, spaced apart hulls connected with a deck, and an integral propulsion system for propelling the hull,

- a) the hull having forward and aft flexible seals that enable pressured air to be trapped in an air space that is positioned generally in between the hulls and in between the seals,
- b) the hull containing a powered lift fan system for transmitting air to the air space,
- 10 c) wherein each hull has a propeller shaft positioned above the hull baseline, and
- d) wherein the hull is operable in two modes, a first low speed mode wherein the propellers are fully submerged and a second high speed mode wherein the propellers are partially submerged surface piercing propellers.

15 39. A catamaran surface effect ship comprising a catamaran surface effect hull having a hull baseline, spaced apart hulls connected with a deck, and an integral propulsion system for propelling the hull,

- 20 a) the hull having forward and aft flexible seals that enable pressured air to be trapped in an air space that is positioned generally in between the hulls and in between the seals,
- b) wherein each hull has a propeller shaft positioned above the hull baseline, and
- 25 c) wherein the hull is operable in two modes, a first low speed mode wherein the propellers are fully submerged and a second high speed mode wherein the propellers are partially submerged surface piercing propellers.